

IN THE CLAIMS

What is claimed is:

- 5 1. A method of making a semiconductor device comprising:
- forming a conductive layer that contacts a via, wherein the
- conductive layer includes a higher concentration of an electromigration
- retarding amount of a dopant near the via than away from the via.
- 10 2. The method of claim 1 wherein the dopant is selected from the
- group consisting of aluminum, cadmium, magnesium, tin, and zirconium.
3. The method of claim 1 wherein the surface of the conductive layer
- near the via includes the dopant at a concentration of between about 0.1
- atomic % and about 10 atomic %.
- 15 4. The method of claim 1 wherein the concentration of the dopant
- near the via is at least about twice the concentration of the dopant away
- from the via.
5. A method of making a semiconductor device comprising:
- forming on a substrate a via and a conductive layer that contacts
- the via;
- 20 introducing into the conductive layer near the via an
- electromigration retarding amount of a dopant to cause the conductive
- layer to have a higher concentration of the dopant near the via than away
- from the via.

6. The method of claim 5 wherein the via is formed prior to forming the conductive layer and the conductive layer is formed on top of the via.
7. The method of claim 5 wherein the conductive layer is formed prior to forming the via and the via is formed on top of the conductive layer.
- 5 8. The method of claim 6 wherein the dopant is introduced by:
- exposing a portion of the conductive layer where it covers the via;
- bringing the dopant into contact with the exposed portion of the conductive layer; and
- applying heat to cause the dopant to diffuse into the conductive layer.
- 10 9. The method of claim 8 wherein the dopant is brought into contact with the exposed portion of the conductive layer by depositing a dopant containing layer onto that exposed portion.
10. The method of claim 8 wherein the dopant is brought into contact with the exposed portion of the conductive layer by ion implanting the dopant into that exposed portion.
- 15 11. The method of claim 8 wherein the dopant is brought into contact with the exposed portion of the conductive layer by subjecting that exposed portion to a gas that contains the dopant.
- 20 12. The method of claim 7 wherein the dopant is introduced by:
- bringing the dopant into contact with the portion of the conductive layer that lies beneath the via; then

applying heat to cause the dopant to diffuse into the conductive layer.

13. The method of claim 12 wherein the dopant is brought into contact with the exposed portion of the conductive layer by depositing a dopant containing layer onto that exposed portion.

14. The method of claim 12 wherein the dopant is brought into contact with the exposed portion of the conductive layer by ion implanting the dopant into that exposed portion.

15. The method of claim 12 wherein the dopant is brought into contact with the exposed portion of the conductive layer by subjecting that exposed portion to a gas that contains the dopant.

16. A method of making a semiconductor device comprising:
forming a conductive layer on a substrate;
forming a dielectric layer on the conductive layer;
etching a via through the dielectric layer, the via being located above a portion of the conductive layer; and
introducing a dopant into that portion of the conductive layer.

17. The method of claim 16 further comprising:
forming a barrier layer on the conductive layer;
forming the dielectric layer on the barrier layer; and
etching the via through a portion of the barrier layer, after etching the via through the dielectric layer, to expose the portion of the conductive layer above which the via is located.

18. The method of claim 17 wherein the dopant is introduced into the exposed portion of the conductive layer by depositing a dopant containing layer onto that exposed portion.

19. The method of claim 17 wherein the dopant is introduced into the exposed portion of the conductive layer by ion implanting the dopant into that exposed portion.

20. The method of claim 17 wherein the dopant is introduced into the exposed portion of the conductive layer by subjecting that exposed portion to a gas that contains the dopant.

21. A method of making a semiconductor device comprising:
forming a dielectric layer on a substrate;
etching a via through the dielectric layer and a trench into the dielectric layer;
filling the via and trench with a conductive layer;
exposing a portion of the conductive layer that lies above the via;
and
introducing a dopant into the exposed portion of the conductive layer.

22. The method of claim 21 wherein the dopant is introduced into the exposed portion of the conductive layer by depositing a dopant containing layer onto that exposed portion.

23. The method of claim 21 wherein the dopant is introduced into the exposed portion of the conductive layer by ion implanting the dopant into that exposed portion.

24. The method of claim 21 wherein the dopant is introduced into the exposed portion of the conductive layer by subjecting that exposed portion to a gas that contains the dopant.

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